

# FX1

## SERVICE MANUAL



 *iconix*



**WARNING:**



Semiconductor devices used in this equipment may be permanently damaged due to electrostatic potentials encountered in routine handling, testing and storage.

**Antistatic precautions MUST be followed when servicing this product.**



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# 1. SPECIFICATIONS

**Supply Voltage:** Nominal .... 12V DC  
Maximum .... 19V DC  
Reverse polarity protection diode fitted.

**Low Battery Indication:** Below 11.4 Volts the LOW BAT pointer ▲ will be on.  
The FX1 switches off at approximately 10 Volts.

**Supply Current:** Approximately 100 mA including loadbar set.

**Temperature Range:** -5°C to +50°C

**Zero Tracking:** Small residual weights left on the scale between weighings (dirt build up) are automatically 'zero-tracked' out and the scale restored to zero. As this occurs the ZERO pointer ▲ will indicate that ZERO has been reached.

The zero-tracking amount is set to 0.5% of the weight displayed after the last press of the **WEIGH** key, with a 2.2 kg maximum.

At switch-on the zero-tracking amount is initialised to 0.015% of capacity (0.3 kg for 2000 kg loadbar set).

**Resolution:** Autoranges in graduated steps from the zero point of the scale.

## SCALE 1

Standard Loadbars	Metric Model	Resolution	Imperial Model	Resolution
	0 - 20 kg	0.1 kg	0 - 40 lb	0.2 lb
	20 - 50 kg	0.2 kg	40 - 100 lb	0.5 lb
	50 - 200 kg	0.5 kg	100 - 400 lb	1 lb
	200 - 500 kg	1 kg	400 - 1000 lb	2 lb
	500 - 2000 kg	2 kg	1000 - 4000 lb	5 lb

**Minimum Capacity:** 20 kg (The 0 - 20kg range is available but is not part of the EMC specification).

## SCALE 2

Vet Scale				
	0 - 100 kg	0.05 kg	0 - 200 lb	0.1 lb
	100 - 300 kg	0.1 kg	200 - 600 lb	0.2 lb

## SCALE 3

Heavy-Duty Loadbars				
	0 - 100 kg	0.5 kg	0 - 200 lb	1 lb
	100 - 200 kg	1 kg	200 - 400 lb	2 lb
	200 - 1000 kg	2 kg	400 - 2000 lb	5 lb
	1000 - 3000 kg	5 kg	2000 - 6000 lb	10 lb

**Accuracy:**  $\pm 0.5\%$  of Displayed Reading  $\pm 1$  Division (where 1 division is 0.1kg, 0.5kg etc depending on weight range)

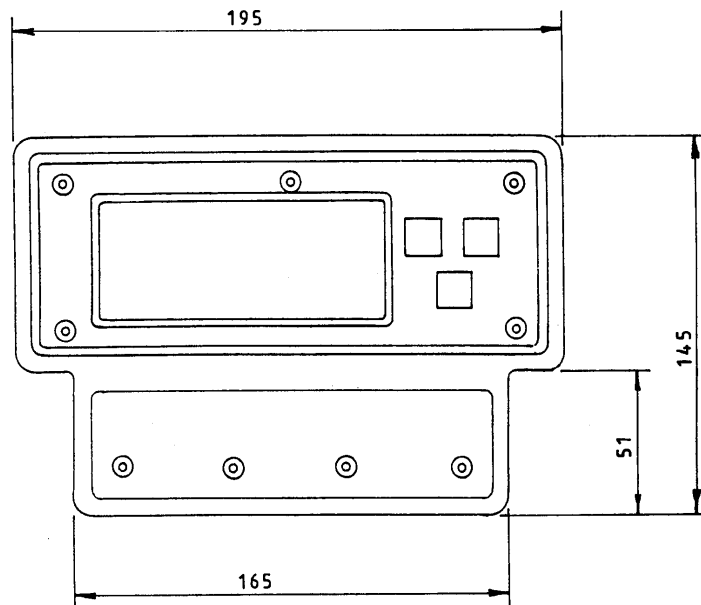
**RF Immunity:** Maximum additional error in a 3V/m RF field in the range 27 - 500 MHz is :  
 $\pm 2$  divisions for 20 - 50 kg  
 $\pm 1$  division for 50 - 200 kg  
 $\pm 0$  division for 200 - 2000 kg

**EMC Approvals:** Meets or exceeds the following standards:  
IEC801-2 Electrostatic discharge  
EM50081-1 Free radiation measurements  
EM50082-1 RF immunity

**Note:** The EMC Approvals apply to FX1 PCB4401 Version E and later.

## 2. MECHANICAL

<b>Case Material:</b>	Polycarbonate alloy
<b>Case Fixing Screws:</b>	9 x self tap screws 6G x $\frac{3}{4}$ T25 pan square behind top and bottom front decals.
<b>Connector Type:</b>	Loadbar connectors: Amphenol 7 Pin C16 chassis socket Battery connector: 3 pin MIC chassis plug
<b>Case Sealing:</b>	Silicone rubber tubing, silicone grease coated
<b>Case Venting:</b>	0.7 mm breather hole drilled in back case or (for older models) 3mm bottom centre gap in silicone rubber tubing.
<b>Key Pad Type:</b>	Alps PCB tact switches operated through polycarbonate decal
<b>Environmental Standard:</b>	Approved to IP65
<b>Dimensions in mm:</b>	



### 3. OPERATING INSTRUCTIONS

#### GETTING STARTED

- ◆ **Either:** Attach the battery cable to the indicator and clip onto a 12V DC battery (car, tractor, battery, etc). ENSURE CORRECT POLARITY: red clip to +, black clip to -.
- Or:** Plug the *Iconix* AC adaptor (optional accessory) into the indicator for mains powered operation.
- ◆ Connect the two loadbar cables to the loadbar sockets on the underside of the indicator.
- ◆ Press the **ON/ZERO** key. The scale will automatically return to zero. When complete the ZERO pointer ▲ will show that the scale is at zero.  
  
**NOTE:** If a large load (such as a partly filled wool bale in a wool press) remains on the scale from previous use, the last weight will be displayed. The operator can continue the weighing session from where last finished.  
Alternatively, press **ON/ZERO** to return the scale to zero.
- ◆ Check that the ZERO pointer ▲ is displayed. Load the animal onto the platform. Press the **WEIGH** key. The animal is accurately weighed and the result locked on the display.
- ◆ Remove the animal from the weighing platform. The last animal's weight remains locked on the display. Check that the ZERO pointer ▲ is displayed between animal weighings. If the ZERO ▲ pointer does not appear, hold the next animal back, keep hands etc clear of the crate and press the **ZERO** key. The scale will return to zero and the weighing session can proceed.
- ◆ At the end of the weighing session, switch the indicator **OFF**. Disconnect the battery and loadbar cables.

**ENSURE THAT THE CAPS ARE FIRMLY REPLACED  
ON THE LOADBAR AND INDICATOR CONNECTORS**

#### WEIGHING MODES

##### **FREE MODE**

At switch **ON** the scale operates in FREE MODE, which is suitable for static load weighing. The display is continuously updated with the weight currently on the scale. The scale can be returned to FREE MODE by pressing the **ON/ZERO** key, noting that the scale should be empty, since the scale will be zeroed.

##### **HOLD MODE**

A press of the **WEIGH** key switches the scale to HOLD MODE, which is suitable for live animal weighing. A press of the **WEIGH** key starts an averaging process which then displays the accurate weight of a moving animal. The weight is locked on the display until the next key press.

## 4. SYSTEM CARE

The FX1 weighing system has been designed to work reliably for long periods of time under adverse conditions. However like any equipment, common sense and care will assist in keeping it in good operating condition.

### **ESSENTIAL CARE**

- ◆ Fit caps to cable ends and indicator sockets when not in use to protect from dirt and moisture. Hang the cable ends up, out of mud and dust.
- ◆ Damage may occur if the capacity of the scale is exceeded.
- ◆ Loadbar cables must be kept in good condition.

### **SITE PREPARATION**

The choice of weighing site is important for accurate weighing results and ease of use.

- ◆ A well chosen site that is level will ensure the best conditions for accurate weighing.
- ◆ The loadbars must be bolted to the platform or crate and be firmly attached to the ground or concrete pad.
- ◆ Any rocking or twisting of the platform could result in weighing errors.
- ◆ Adequate clearance around the platform is essential. Any binding or rubbing with posts or gates will produce weighing errors.
- ◆ The race bracket is best mounted on a fence or post and not the crate.
- ◆ Mount the indicator in a well lit position for best readability.
- ◆ A well chosen site will help animals flow smoothly through the system.
- ◆ Mounting the indicator away from the crate will help to keep hands free of the crate when the weigh cycle is started.

## 5. CONNECTORS

### POWER CONNECTOR (MIC 3 Pin Male)

Pin 1	No Connection
Pin 2	DC(+)
Pin 3	DC(-)

### LOADBAR SOCKETS (Amphenol C16 7 Pin Female)

Pin 1	Ex (-)	Black
Pin 2	Sig (-)	White
Pin 3	Sig (+)	Green
Pin 4	Ex (+)	Red
Pin 5	Scale Select 1	
Pin 6	Scale Select 2	
Pin 7	Scale Select 3	

## 6. SCALE BASE SELECTION

At switch **ON** the indicator automatically configures to a scale capacity determined by the position of wire links in the Amphenol plugs of the loadbars.

The scale capacities are factory set to suit standard loadbar types as follows :

Scale 1	2000 kg	Loadbar Plug Link: Pin 4 - Pin 5
Scale 2	300 kg	Loadbar Plug Link: Pin 4 - Pin 6
Scale 3	3000 kg	Loadbar Plug Link: Pin 4 - Pin 7

**Note:** Product made to specific order with non-standard scale bases may have different settings from those shown.

## 7. SPAN CALIBRATION

**NOTE:** The span calibration procedure is performed independently for each scale (1, 2 and 3).

- ◆ Plug the scale base (loadbars etc) into the indicator.
- ◆ Hold the **WEIGH** key down, then press the **ON/ZERO** key, releasing the **WEIGH** key when '5 E t' appears.

Display reads (for example)	P 2 . 0 6
then	5 E t
then after 3 seconds	0 . 0

The indicator is now in a state that allows spanning to be performed.

- ◆ With no weight on the scale, zero the scale with the **ON/ZERO** key.
- ◆ Place the test weight (e.g. 500kg) on the scale, allow a few seconds to settle, then press **ON/ZERO** and **WEIGH** simultaneously.

**NOTE:** To ensure that system accuracy is maintained, the test weight should be as close as possible to the maximum working capacity of the scale base.

To maintain system accuracy over the full range, the minimum test weight value for a 2000 kg capacity scale base is 500 kg.

- ◆ The display will show '5 P R n' while weighing the test weight, then display to the nearest kilogram, according to the present calibration. e.g '0 5 2 3'.

Change the displayed weight to the correct value (in kilograms) using:

<b>ON/ZERO</b>	= Scroll	↑
<b>WEIGH</b>	= Scroll	↓

One press of a scroll key will increase (or decrease) the weight by 1 kg.

For large adjustments to the displayed weight, hold down the required scroll key for more than 1 second, for rapid repeat scrolling.

- ◆ When the displayed reading is the same as the test weight, press no keys for 5 seconds. '5 R U E' is displayed as the new calibration is stored in EEPROM.

### NOTE:

Having completed the span procedure, the scale should be switched **OFF** then back **ON**, and a series of test weights applied to confirm the accuracy of calibration.

### RESTORING DEFAULT CALIBRATION

If problems arise, for example due to attempting to calibrate with no test weight on the scale, and further attempts to calibrate fail, for V2.06 onwards it is possible to return the FX1 to a default calibration point. During calibration, as soon as the message 'H I' or 'L O' appears on the display, press the **ZERO** key. On return to the normal operating mode, confirm that the FX1 responds when weight is applied to the scale, then repeat the full calibration procedure.

## 8. SET-UP: GENERAL

**NOTE:** The set-up parameters detailed below are set independently for each scale (1, 2 and 3).

Access to set-up is by holding down the **WEIGH** key at switch-on, as described in the Span Calibration section. As soon as 'SEt' is displayed, release the **WEIGH** key, then press **ON/ZERO**. The parameters are accessed in the following order:

### 1. WEIGHT UNITS

'H G' for kilograms  
'L b' for pounds

To change the setting, use the **ON/ZERO** key.

To accept the displayed setting and step on to the next parameter, press **WEIGH**.

The standard factory setting is kg. If pounds are selected, the scale calibration is changed accordingly.

**NOTE:** In span calibration the Test Weight must ALWAYS be entered in KILOGRAMS, regardless of the weight units setting.

### 2. ZERO-TRACKING

'2-t.1' if enabled  
'2-t.0' if disabled

To change the setting, use the **ON/ZERO** key.

To accept the displayed setting and step on to the next parameter, press **WEIGH**.

Zero-tracking is a feature which automatically restores the scale to zero, by "tracking out" small amounts of dung and dirt left on the scale. It should be enabled for most weighing applications.

### 3. DISPLAY RELEASE

'rEL.1' if enabled  
'rEL.0' if disabled

To change the setting, use the **ON/ZERO** key.

To accept the displayed setting and step on to the next parameter, press **WEIGH**.

The standard factory setting is Display Release OFF, which in HOLD mode keeps the last weighing locked on the display, until the next weighing. For Display Release ON, when the animal that has been weighed is moved from the scale, the displayed weight will not remain locked on the display.

### 4. PERMANENT FREE MODE

Version 2.03 firmware onwards

'FrE.1' if enabled  
'FrE.0' if disabled

To change the setting, use the **ON/ZERO** key.

The standard factory setting is Permanent Free Mode OFF, which puts the indicator into HOLD mode whenever the **WEIGH** key is pressed, locking the weight on the display. When Permanent Free Mode is ON, the **WEIGH** key may be pressed, however the indicator will remain in FREE mode.

After the Permanent Free Mode has been viewed or modified, **WEIGH** is pressed for the final time. 'S R U E' is displayed while the settings are being stored, before returning to the weighing mode.

## 9. SET-UP: AUTORANGING

It is possible to configure each scale (1, 2 and 3) with up to six weight ranges with associated resolution steps, up to the maximum scale capacity of the scale base.

The standard factory settings for the scales are:

		Step (kg)	Range Limit (kg)
Scale 1	2000 kg loadbars	0.1	19.9
		0.2	49.8
		0.5	199.5
		1	499
		2	2200
Scale 2	300 kg vet scale	0.05	99.95
		0.1	400.0
Scale 3	3000 kg loadbars	0.5	99.5
		1	199
		2	998
		5	3300

### WARNING

The factory settings of resolution steps and range limits are the result of many years of experience in the live animal weighing industry. The settings provide a compromise between stability, repeatability and the versatility of the scale for weighing different animal types. Changing to finer resolution settings than standard will probably result in unstable and non-repeatable weight readings. The auto-ranging settings allow the FX1 system to be configured for “one off” applications or for the indicator to be used with alternative scale bases. Please contact technical staff at *Iconix* for advice.

### PROCEDURE

- ◆ Plug the scale base (loadbars etc) into the indicator.
- ◆ Hold the **WEIGH** key down, then press the **ON/ZERO** key, releasing the **WEIGH** key when '5 E t' appears.

Display reads	P 2 . 0 6
then	5 E t
then after 3 seconds	0 . 0
- ◆ Press the **ON/ZERO** and **WEIGH** keys simultaneously.

Display reads	5 P R n
---------------	---------
- ◆ **Immediately** '5 P R n' appears, press the **ON/ZERO** key.

Display reads	r E 5 n
then (for example)	0 . 1
- ◆ Press the **ON/ZERO** key to scroll through the choices of resolution step.

- ◆ Press the **WEIGH** key to store the desired resolution step. The display next shows the first range limit.

Display reads                      *H I -*  
 then (for example)              *0 19.9*

To change the Range Limit setting, use:      **ON/ZERO**    = Scroll ↑  
    **WEIGH**        = Scroll ↓

One press of a scroll key will increase (or decrease) the Range Limit by the resolution step size for this range.

For large adjustments to the Range Limit, hold down the required scroll key for more than 1 second, for rapid repeat scrolling.

- ◆ When the range limit setting is correct, press no keys for 5 seconds.
- ◆ Having accepted the new range limit setting, the FX1 now displays the resolution step for the second range. Repeat the steps above to examine and/or modify the resolution step and range limit for each of the required ranges.
- ◆ The number of ranges used in auto-ranging may vary from 1 to 6. When the required number of ranges have been configured, select zero as the value for the resolution step for the next range. Press the **WEIGH** key to accept this value. The indicator will display '*S R U E*' as it stores the new settings and returns to the normal weighing mode.

### **SINGLE RANGE EXAMPLE**

To set up the FX1 for a single range of 0 - 2000 kg in 5 kg steps:

- ◆ Enter Autoranging Set-Up as above:

Display reads                      *r E 5 n*  
 then (for example)              *0.5*

- ◆ Set the first resolution step to 5 kg using the **ON/ZERO** key:

Display reads                      *5*

- ◆ Store resolution step 1 by pressing the **WEIGH** key:

Display reads                      *H I -*  
 then (for example)              *0 995*

Change Range Limit 1 until it equals the required full scale capacity of 2000 kg, using:

**ON/ZERO**    = Scroll ↑  
**WEIGH**        = Scroll ↓

- ◆ Display now reads:                      *2000*

- ◆ Press no keys for 5 seconds to accept the new setting.

- ◆ Using the **ON/ZERO** key, change the setting of the resolution step for range 2, until:

Display reads                      *0*

- ◆ Press the **WEIGH** key to store the new settings and return to normal weighing:

Display reads                      *S R U E*

## 10. SERVICING

**NOTE:** All adjustable parameters are accessible by front panel key presses.  
The FX1 has no internal adjustments.

### DISASSEMBLY

**NOTE:** The front decals (front panel labels) can not be re-used. Obtain a replacement set before starting this procedure.

- ◆ Carefully lift up a corner of the top and bottom front decals. Peel the complete decals off and discard.
- ◆ Remove the five top and four bottom case screws.
- ◆ Carefully split the case halves, observing that the indicator PCB is attached to the front and the loadbar and battery connectors are attached to the rear.

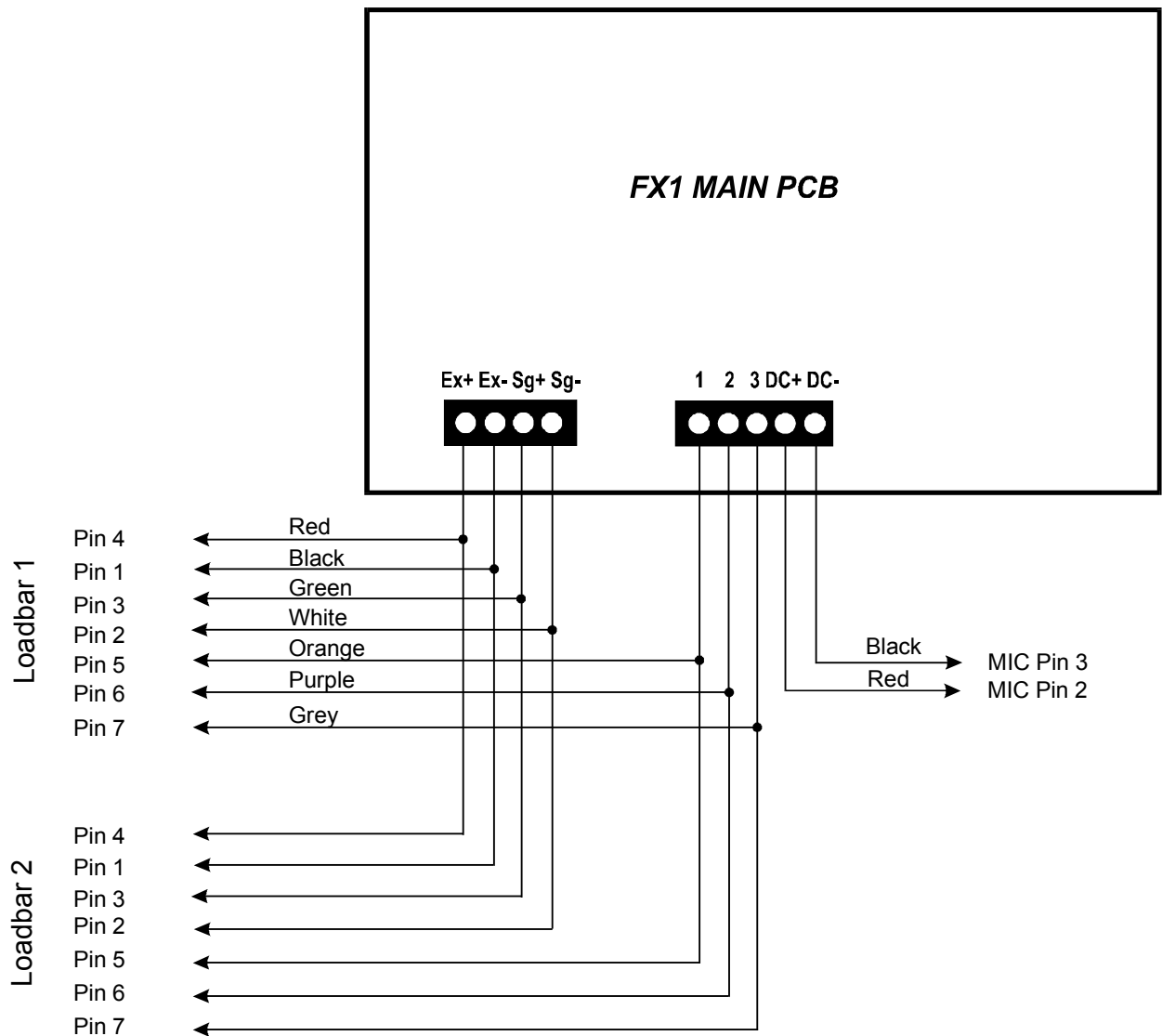
### REASSEMBLY

**NOTE:** Maintaining the IP65 waterproofing standard of the indicator requires that new decals must be fitted according to the following procedure.

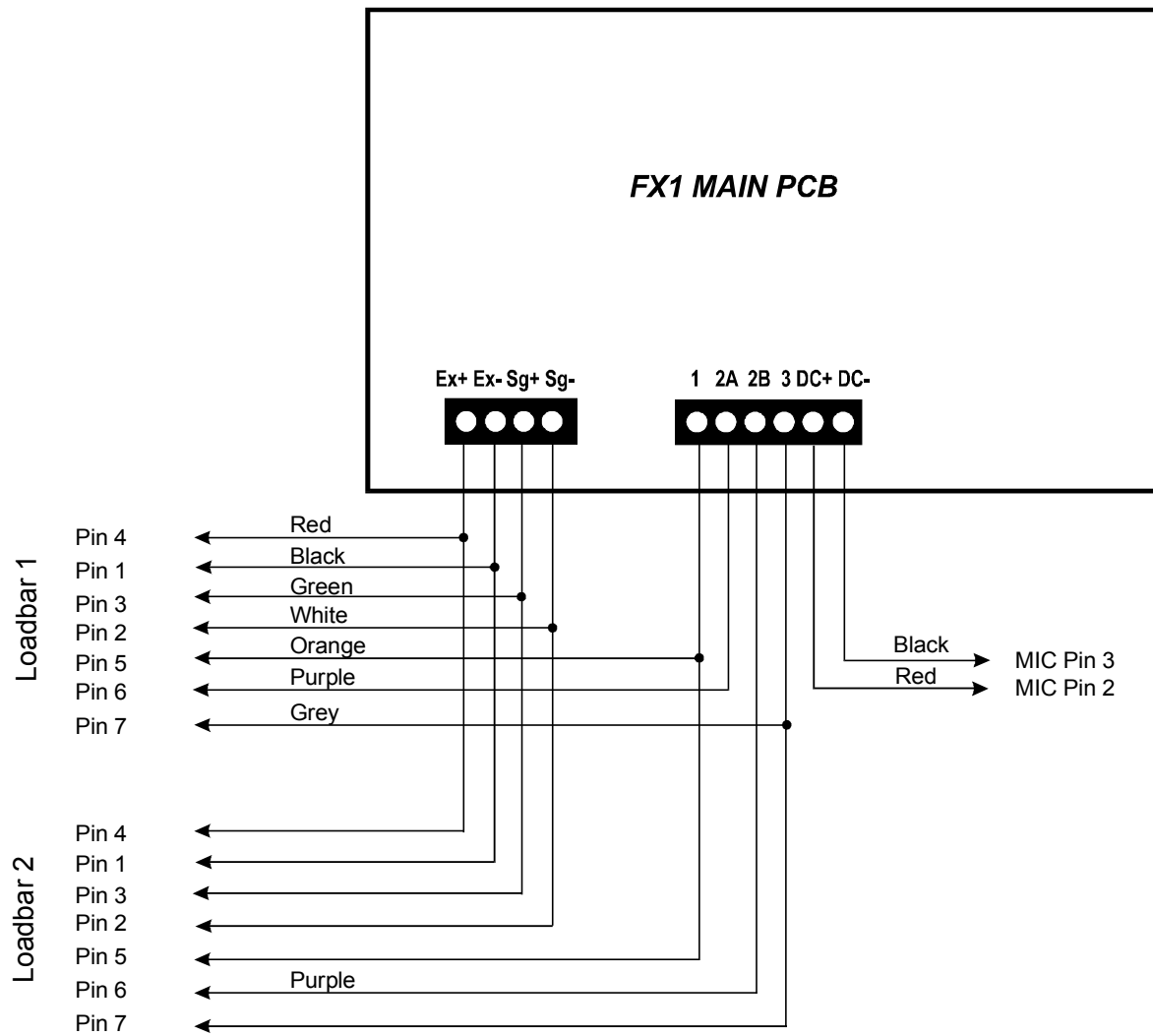
- ◆ Ensure that the silicone tubing embedded in the case front has an adequate coating of silicone grease applied to it. For older models, check that there is a 3 mm gap between the ends of the silicone tubing in the bottom centre of the case (case breather). Newer models have a 0.7mm breather hole drilled in the recessed part of the case rear (above where the plastic insert is fitted) and there should be no gap between the ends of the silicone tubing.
- ◆ Ensure that the silica gel desiccant pack is returned to the case rear.
- ◆ Fit the case halves together and then fit the case screws.
- ◆ Switch on the indicator and check that it is working properly.
- ◆ Thoroughly clean the indicator surfaces, ensuring that all traces of the old decals are removed. Clean the surfaces with ISOPROPYL ALCOHOL and keep fingers etc off the surfaces prior to application of the decals. This is particularly important around the screw holes as the decal provides water sealing of the screw holes.
- ◆ Ensure that the plastic key caps are fitted to the three key switches.
- ◆ Peel the protective backing off each decal and carefully fit in place ensuring no finger contact with adhesive backing or indicator surface. Without damaging the decal surface, firmly smooth the decal down paying particular attention to the perimeter of the decals and around the window area.

# 11. PCB CONNECTIONS

## Current Model FX1 Indicators



## Early Model FX1 Indicators



## 12. PARTS LIST

Description	Iconix Part Number
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### **Indicator Assembly**

Chassis Socket Amphenol	0099407
Cap Chassis Socket Amphenol	0116838
Chassis Plug 3 Pin MIC	0147269
PCB Assembly FX1 27mm LCD	0400538
Decal FX1-27mm Upper English	0400611
Decal FX1-27mm Lower English	0400613
Decal Set FX1 English (3 pcs) – OLD: for 21mm LCD	0400581
Case Front FX1 + Window, No Decals	0400041
Case Rear Assembly FX1 complete with Connectors	0400040
Case Insert Rear FX1	0198568
Key Cap - Tact Switch	0159200
Screw FX1 Case 6G x ¾ Stainless T25 Pan Square	0157602

### **Components on Main PCB**

IC AT89S52 Microcontroller FX1 Programmed	0210017
IC AT24C02PC EEPROM	0400051
IC AY0438/P LCD Driver	0195307
(If replacing S4521 with AY0438, change adjacent 4700pF ceramic to 100pF)	
IC TC7650CPD Op Amp	0134573
IC TC500CPE A/D Converter	0134658
LCD Custom 4 Digit 27mm, for PCB4401G and later	0400528
(Must be sourced from Iconix NZ Ltd)	
LCD Custom 4 Digit 21mm (OLD), for PCB4401F and earlier	0198940
(Must be sourced from Iconix NZ Ltd)	

### **Accessories**

Battery Cable Assembly	0147375
Instruction Card FX1 English	0208960
Race Bracket FX1	0199930

## EEPROM REPLACEMENT

When the FX1 is switched on for the first time after replacement of the EEPROM, the display will normally show 'P P E E'. Press the **WEIGH** key within 5 seconds of switch-on to programme the EEPROM with default settings for span calibration and set-up parameters.

This must be done with the scale base connected. If the indicator is to be used with different scale types, the same procedure must be followed for each.

After EEPROM replacement, span calibration must be performed for each scale (1, 2 or 3) used.

## SERIAL NUMBER CODE

Example: 6 09 XM01 123

where:

6	=	Year of Manufacture	(2006)
09	=	Month of Manufacture	(September)
XM01	=	Model FX1	
123	=	Serial Number	

## FIRMWARE UPGRADES

All generations of FX1 PCBs may be upgraded to the latest firmware. When the microcontroller (0210017) is ordered, it will be supplied with the latest version of the program.